equilibrium, using the linear approximation and according to (2)

$$\tau_T \dot{a} + (a - a_o) = \left(\frac{\partial a}{\partial T}\right)_A (T - T_o) + \left(\frac{\partial a}{\partial A}\right)_T (A - A_o) \qquad (3)$$

where the equilibrium values of the derivatives are found from the equation of state for the subsystem and

$\tau_T = \left\{ L\left(\frac{\partial A}{\partial a}\right)_T \right\}^{-1}$ is the time of isothermic internal relaxation. In this approximation

$$\dot{Q} = \alpha(T - T_o) \qquad (4)$$

where α is the coefficient of thermal conductivity between the subsystem and the thermostat, and Q is the heat given by the subsystem to the thermostat. Using well known thermodynamic relations and the linear approximation we find that

Thermodynamical Derivation of Dynamic Susceptibility

$$\dot{T} + \frac{1}{\tau_a}(T - T_o) = \frac{T_o}{C_a}\left(\frac{\partial A}{\partial T}\right)_a \cdot \dot{a}, \qquad (5)$$

where C_a is the thermal capacity of the system and

$$\tau_a = \frac{C}{a} \qquad (6)$$

is the time of external relaxation at constant a. For A = const both external and internal relaxation takes place in the subsystem. The time of external relaxation at constant A can only be usefully introduced when the internal relaxation can be neglected. In the case of adiabatic isolation of the subsystem ($\alpha \equiv 0$), eliminating $T-T_o$ from (5) and (3) we find that the adiabatic relaxation time for internal relaxation is

$$\tau_s = \tau_T \frac{C_a}{C_A}$$

Card 4/5 When $A-A_o$ varies periodically with frequency ω we find

SOV/126-6-2-26/34

Thermodynamical Derivation of Dynamic Susceptibility

using (3) and (5) that the dynamic "susceptibility" is given by:

$$\left(\frac{\partial a}{\partial A}\right)_{\omega} = \left(\frac{\partial A}{\partial A}\right) \quad \frac{1 + i\omega\tau_a}{1 + i\omega(\tau_T+\gamma\tau_a)-\omega^2\tau_a\tau_T}$$

There are 3 Soviet references.

(NOTE: This is a complete translation)

ASSOCIATION: Ural'skiy politekhnicheskiy institut;Ural'skiy filial AN SSSR (Ural Polytechnical Institute;Ural Branch of the Ac.Sc. USSR)

SUBMITTED: April 16, 1956

Card 5/5 1. Thermodynamics--Mathematical analysis

AUTHOR: Shmatov, V. T. SOV/126-6-3-29/32

TITLE: On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters (K termodinamicheskoy teorii relaksatsionnykh protsessov v sistemakh s dopolnitel'nymi parametrami)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 3, pp 570-571 (USSR)

ABSTRACT: Consider a thermodynamic system which is characterised by the temperature T, generalised force A and a co-ordinate a conjugate to it, and is described by the equation of state, $A = A(T, a)$, as well as a certain additional internal parameter η, which in the equilibrium state of the system, is a function of a and t, i.e., $\eta = \eta(a, t)$. We shall assume that the additional parameter η characterises a definite internal property of the system, for example, the degree of long- and short- range order, spontaneous magnetisation or electrical polarisation, antiferromagnetic order, etc. When the state of the system changes with time, the parameter η assumes a non-equilibrium value $\eta \neq \eta(a, T)$, as a result of which the system as a whole will pass through non-equilibrium states. We shall assume that, in a non-equilibrium state, the free

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On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

energy of the system is $F = F(T, a, \eta)$, where $F_\eta(T, a, \eta) \neq 0$ (the subscript denotes differentiation with respect to the corresponding parameter). It follows that in a non-equilibrium state of the system:

$$A = -F_a(T, a, \eta) \quad . \tag{1}$$

In an equilibrium state:

$$F_\eta(T, a, \eta) = 0 \quad F_{\eta\eta} > 0 \quad . \tag{2}$$

According to(Ref.1) the change in the entropy for a non-equilibrium state of the system is given by:

$$TdS = dU + Ada - F_\eta d\eta \quad , \tag{3}$$

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On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

where $U(T, a, \eta)$ is the internal energy. The last item in Eq.(3) describes the non-equilibrium part of the entropy change. From the expression for the increase of entropy, which is a direct consequence of Eq.(3), i.e.:

$$T\dot{\Delta S} = -F_\eta \dot{\eta} \quad ,$$

we have in the approximation of the thermodynamics of irreversible processes (Ref.2):

$$\dot{\eta} = -LF_\eta(T, a, \eta) \quad , \tag{4}$$

where the kinetic coefficient $L>0$ since $\dot{\Delta S}>0$. Eq.(4) holds for small deviations of the parameter η from its equilibrium value and, in special cases, coincides with those used in (Ref.3). If one expands F_η into a series about the position of equilibrium and retains only linear terms, one obtains from Eqs.(4) and (2) an expression which describes the variation of η with time:

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

$$\tau^{aT}\dot{\eta} + \Delta\eta = \left(\frac{\partial\eta}{\partial a}\right)_T \Delta a + \left(\frac{\partial\eta}{\partial T}\right)_a \Delta T \quad , \tag{5}$$

where $\tau^{aT} = (LF_{\eta\eta})^{-1}$ is the relaxation time of the additional parameter η at constant a and T. It is possible to show, starting with Eqs.(1) and (2) and the adiabatic condition, that with another choice of the variables, Eq.(5) will have the form:

$$\tau^{xy}\dot{\eta} + \Delta\eta = \left(\frac{\partial\eta}{\partial x}\right)_y \Delta x + \left(\frac{\partial\eta}{\partial y}\right)_x \Delta y \quad , \tag{6}$$

where x and y are two arbitrary variables involving T, a, A and the entropy S, and τ^{xy} is the relaxation

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

time of the parameter η at constant x and y. The relaxation times are connected by the following relations:

$$\tau^{aT} = \tau^{AT} \frac{\left(\frac{\partial A}{\partial a}\right)_T}{\left(\frac{\partial A}{\partial a}\right)_T - \left[\left(\frac{\partial A}{\partial a}\right)_T\right]} = \tau^{Aa} \frac{\left(\frac{\partial A}{\partial T}\right)}{\left(\frac{\partial A}{\partial T}\right)_a - \left[\left(\frac{\partial A}{\partial T}\right)_a\right]} =$$

$$= \tau^{TS} \frac{\left(\frac{\partial A}{\partial T}\right)_a}{\left(\frac{\partial A}{\partial T}\right)_a - \left[\left(\frac{\partial A}{\partial T}\right)_a\right]} = \tau^{aS} \frac{C_a}{C_a - [C_a]} = \tau^{AS} \frac{\left(\frac{\partial A}{\partial a}\right)_T}{\left(\frac{\partial A}{\partial a}\right)_T - \left[\left(\frac{\partial A}{\partial a}\right)_T\right]} \cdot \tag{7}$$

$$\cdot \frac{C_A}{C_A - [C_A]} ,$$

where C_a and C_A are the specific heats of the system, $[C_a]$ and $[C_A]$ are the specific heats of the sub-system at

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

constant a and A. The latter two specific heats are associated with those degrees of freedom which are responsible for the appearance of properties characterised by the parameter η. The quantities:

$\left[\left(\frac{\partial A}{\partial a}\right)_T\right]$ and $\left[\left(\frac{\partial A}{\partial T}\right)_a\right]$ determine the contribution to:

$\left(\frac{\partial A}{\partial a}\right)_T$ and $\left(\frac{\partial A}{\partial T}\right)_a$, due to these degrees of freedom.

When the system is periodically disturbed at a frequency ω, we have, on calculating the dynamical derivatives, using Eqs.(1), (2), (5) and (7) and the adiabatic condition:

$$\left(\frac{\partial y}{\partial x}\right)_{z,\,\omega} = \left(\frac{\partial y}{\partial x}\right)_z \frac{1 + i\omega\tau^{yz}}{1 + i\omega\tau^{xz}}, \qquad (8)$$

where x, y, z are three arbitrary variables involving T,

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

a , A and S . Near the Curie point, using the thermodynamic theory of phase transitions of the second kind, we have, according to the above:

$$\frac{\tau^{yz}}{\tau^{xz}} = 1 - \frac{\Delta\left(\frac{\partial y}{\partial x}\right)_z}{\left(\frac{\partial y}{\partial x}\right)_z} \qquad (9)$$

where $\Delta\left(\frac{\partial y}{\partial x}\right)_z$ is the jump in $\left(\frac{\partial y}{\partial x}\right)_z$ at the Curie point.

A generalization of the above results to an arbitrary number of parameters leads to the following result:

$$\left(\frac{\partial y}{\partial x}\right)_{z,\,\omega} = \left(\frac{\partial y}{\partial x}\right)_z \prod_{n=1}^{N} \frac{1 + i\omega\tau_n^{yz}}{1 + i\omega\tau_n^{xz}} \qquad (10)$$

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

Now the variation of η_n with time cannot be characterised by a single relaxation time, as was the case with a single parameter, since the approach of the η_n to their equilibrium values, η_n^o at constant x and y will be described by the following expression:

$$\eta_n = \eta_n^o + \sum_{k=1}^{N} A_{nk}^{xz} e^{-\frac{t}{\tau_k^{xz}}}, \quad n = 1, 2, \ldots, N,$$

where A_{nk}^{xz} are functions of τ_k^{xz} and the initial

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SOV/126-6-3-29/32

On the Thermodynamic Theory of Relaxation Processes in Systems with Additional Parameters

conditions. There are no figures, and 3 Soviet references.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR (Institute of Physics of Metals of the Ural Branch of the Academy of Sciences, USSR)

SUBMITTED: April 16, 1957.

1. Thermodynamics--Theory 2. Thermodynamics--Mathematical analysis
3. Equations of state--Applications 4. Phase transitions

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SOV/126-6-6-3/25

AUTHOR: Shmatov, V. T.

TITLE: Internal Friction and Absorption of Sound in Systems with Auxiliary Internal Parameters (Vnutrenneye treniye i pogloshcheniye zvuka v sistemakh s dopolnitel'nymi vnutrennimi parametrami)

PERIODICAL: Fizika metallov i metallovedeniye, 1958, Vol 6, Nr 6, pp 984-993 (USSR)

ABSTRACT: By an auxiliary internal parameter the author understands a quantity which describes an internal property of a system and is a function of state under equilibrium conditions. When the system is perturbed the return of the auxiliary internal parameter η to its equilibrium value produces a lag which appears as an inelastic effect: internal friction and absorption of sound. Internal friction may occur in systems where η is the degree of long-range order (Refs.1-5), in substitutional (Ref.3) and interstitial (Ref.6) solid solutions, where η is the degree of the predominant distribution of atoms produced by deformation. Internal friction may occur also in antiferromagnetics where η is the degree of anti-

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Internal Friction and Absorption of Sound in Systems with Auxiliary Internal Parameters

ferromagnetic order. Internal friction can be expected also in ferromagnetics, ferrites, ferroelectrics and piezo-electrics, in which η is, respectively, the spontaneous magnetization, spontaneous and forced electric polarization. In general, internal friction occurs in systems with an auxiliary parameter whose change is accompanied by perturbation of the system and in which perturbation of the system alters the value of the auxiliary parameter. On propagation of sound in a system with an auxiliary internal parameter, local variations in the state of the system will produce relaxational absorption of sound, since the system as a whole will pass through non-equilibrium states. Such absorption of sound occurs in liquids and in multiatomic gases. The author calls acoustic absorption in solids - internal friction, and acoustic absorption in gases and liquids - absorption of sound. The paper gives a thermodynamic theory of internal friction and relaxational absorption of sound in systems with auxiliary internal parameters. Formulae are given for the magnitude of internal friction and values of the velocity and the coefficient of absorption of sound in such systems. Near the point where a II-type phase transition occurs (if the latter

Internal Friction and Absorption of Sound in Systems with Auxiliary Internal Parameters

is due to the existence of an auxiliary internal parameter) a relationship is found between discontinuities of elastic moduli and the value of internal friction, as well as a relationship between discontinuities of the square of sound velocity and the value of the coefficient of absorption of sound. It was found that internal friction and absorption of sound reach their maximum values near the Curie point. The results obtained for internal friction and absorption of sound are of a general character and do not depend on the

Internal Friction and Absorption of Sound in Systems with Auxiliary Internal Parameters

nature of the auxiliary internal parameters of the system. This paper is entirely theoretical. There are 13 references, 6 of which are Soviet, 2 German and 5 English.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR (Institute of Metal Physics, Ural Branch. Academy of Sciences USSR)

SUBMITTED: June 18, 1957.

Card 4/4

SHMATOV, V.T.

SOV-3-58-9-25/36

AUTHOR: Piguzov, Yu.V., Candidate of Technical Sciences, Moscow Institute of Steel imeni I.V. Stalin

TITLE: Relaxation Phenomena in Pure Metals and Alloys (Relaksatsionnyye yavleniya v chistykh metallakh i splavakh)

PERIODICAL: Vestnik vysshey shkoly, 1958, Nr 9, pp 72-73 (USSR)

ABSTRACT: From 2-4 April 1958, an Intervuz Conference on the "Relaxation Phenomena of Pure Metals and Alloys" took place at the Moskovskiy institut stali (Moscow Institute of Steel). The conference was attended by 196 representatives of 24 higher educational institutions and 31 scientific-research institutes (including 8 institutes of the USSR AS), from 13 cities of the Soviet Union. Doctor K. Mishek of the Prague Institute of Technical Physics and Den Ge Sen of the Pyongyang State University were also present. S.I. Filippov, Deputy Director of the Institute of Steel, opened the conference. A reviewing report was delivered by B.N. Finkel'shteyn [Finkelstein (Moscow Institute of Steel). V.T. Shmatov (Institute of Physics of the USSR AS in Sverdlovsk) and N.S. Fastov (Tsentral'nyy nauchno-issledovatel'skiy institut chërnoy metallurgii (TsNIIChM) Central Scientific-Research Institute of Ferrous Metallurgy) reported on "Application of the Thermodynamics of Non-Balanced Conditions."

Card 1/1

AUTHORS: Skrotskiy, G. B., Shmatov, V. T. SOV/56-34-3-32/55

TITLE: On the Thermodynamical Theory of Resonance and Relaxation Phenomena in Ferromagnetics
(K termodinamicheskoy teorii rezonansnykh i relaksatsionnykh yavleniy v ferromagnetikakh)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 3, pp. 740-745 (USSR)

ABSTRACT: The present work shows the following: Using the thermodynamical method of irreversible processes equations for the time change of the magnetization taking into account the spin-spin relaxation and the spin-lattice relaxation can be obtained on very general and simple conditions. Furthermore the influence of the spin-lattice relaxation on the phenomena of ferromagnetic resonance are discussed. The system of spin-moments responsible for the magnetic properties of the ferromagnetic substances can, from the thermodynamical point of view of be separated into on own sub-system with the temperature T(spin-system). The residual degrees of freedom of the complete system are

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On the Thermodynamical Theory of Resonance and Relaxation Phenomena in Ferromagnetics

here considerad analogously to the thermodynamic theory of paramagnetic relaxation (K. Gorter, Ref 4) as a thermostat the temperature T_o of which is in this work regarded as constant. It can be shown that the last mentioned condition will only slightly become manifest in later given conclusions, and one can also easily free oneself of this condition. The processes of the spin-spin relaxation and of the spin-lattice relaxation in general take place commonly, and they are also connected with each other. In the case of a sufficiently fast change of the field strength $\vec{H}$ the sub-system of the spin moments will be in e non-equilibrium state. The temperature T of the sub-system and the magnetization M do not satisfy the equation of state. In order to take into account the internal relaxation the author puts down an expression for the change of the entropy of the non-equilibrium state of the subsystem:

$$TdS = dU - \vec{H}d\vec{M} + (\vec{H} - \vec{H}^*)\, d\vec{M}$$

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U denoting the internal energy of the subsystem. For the change of the energy in the subsystem

$$Td\,\Delta S/dt = (\vec{H} - \vec{H}^{*})d\vec{M}/dt$$

is found. An equation describes the time modification of magnetization which is dependent on the gyroscopic properties of the magnetic moment and the process of the spin-spin relaxation. The characteristic feature of the isothermal and adiabatic changes of state are shortly shown. Then an expression for the amount of heat dQ is put down which is transferred from the spin system to the lattice during the time dt. The specific heat of the spin system is so great that a radiofrequency field with small amplitude cannot noticeably raise its temperature. Therefore the spin-lattice relaxation has only an unimportant effect and practically escapes observation. The spin-lattic relaxation is neglected in the further considerations. At temperatures far from the Curie point ($T < \theta$) the external field $\vec{H}_o$ does practically not change

On the Thermodynamical Theory of Resonance and Relaxation Phenomena in Ferromagnetics

SOV/56-34-3-32/55

the amount of the vector of spontaneous magnetization $\vec{M} = \vec{M}_s$, but only its direction. The ferromagnetic resonance is in weak fields very insensitive to the detailed form of the equations used for its description. The one or other form of the equations must only then be preferred when non-linear effects are observed.
There are 11 references, 7 of which are Slavic.

ASSOCIATION: Ural'skiy politekhnicheskiy institut
(Ural Polytechnical Institute)

SUBMITTED: October 18, 1957

Card 4/4

SHMATOV, V. T., Candidate Phys-Math Sci (diss) -- "On the thermodynamic theory of relaxation phenomena in systems with supplementary parameters". Sverdlovsk, 1959. 8 pp (Min Higher Educ USSR, Ural State U im A. M. Gor'kiy), 120 copies

(KL, No 22, 1959, 109)

18.8200

66606
SOV/139-59-3-28/29

AUTHOR: Shmatov, V.T.

TITLE: On the Papers of V.S. Postnikov on the Theory of Internal Friction in Metals at High Temperatures

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, 1959, Nr 3, pp 174-175 (USSR)

ABSTRACT: Postnikov (Refs 1, 2) proposes a theory of internal friction in metals at high temperatures. According to Postnikov internal friction is due to directed migration of vacancies in a field of stresses produced by extension and torsional vibrations of the sample. The present author criticizes in detail Postnikov's formulae, for the following reasons. (1) Postnikov assumes that a uniform elastic stress σ_i in a sample (due to the weight of the system producing torsional vibrations) both lowers and increases the energy of formation of vacancies U_1, which is impossible since in this case only one effect may occur: either an increase or a decrease of U_1 (σ_i is a scalar component of a tensor). In addition to this erroneous assumption, Postnikov takes the equilibrium number of vacancies n to be given by

$n = (n_0 + \ldots)$

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On the Papers of V.S. Postnikov on the Theory of Internal Friction in Metals at High Temperatures

The mechanism suggested by Postnikov for internal friction due to motion of vacancies is physically inconsistent. It is known that directed motion of vacancies in a field of elastic stresses is possible only when that field has a gradient. For the above two reasons, Postnikov's formula for the amount of energy scattered by elastic vibrations in a sample, given by Eq (1), and his formula for internal friction, given by Eq (13), are both in error. The physical meaning of the coefficient of proportionality α which is very important in internal friction, is not given at all. (3) At the end of his second paper (Ref 2) Postnikov discusses relationship between the rate of diffusion creep and internal friction. Here again the same error is committed: forced diffusion of atoms is considered "in the direction of action of σ_i stresses" and such diffusion does not in fact occur. It is known that forced diffusion of atoms in that sense can be produced only by a gradient of elastic stresses and not by an elastic-stress field itself. It follows that Postnikov's results on creep and internal friction are

On the Papers of V.S. Postnikov on the Theory of Internal Friction in Metals at High Temperatures

also untenable. It is quite likely that internal friction in metals at high temperatures is related to vacancies but an interpretation different from that of Postnikov is required to explain the facts.

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There are 2 Soviet references.

This is a slightly abridged translation.

ASSOCIATION: Institut fiziki metallov AN SSSR (Metal Physics Institute, Ac. Sc. USSR)

SUBMITTED: March 31, 1959

4

67708

SOV/126-7-3-1/44

18.8200

AUTHOR: Shmatov, V.T.

TITLE: On the Theory of Internal Friction in Substitutional and Interstitial Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 3, pp 321-330 (USSR)

ABSTRACT: In Ref 1 the present author has derived formulae for the internal friction for systems with additional parameters on the basis of general thermodynamic ideas. In the special case of a single additional parameter the internal friction in an isothermal process is given by Eq (1), where ω is the frequency, $\tau_{\varepsilon T}$ is the relaxation time of the additional parameter at constant deformation (ε) and temperature (T). The degree of relaxation of the isothermal elastic modulus Δ may be reduced to the form given by Eq (2), where E' is the non-relaxing part of the modulus (Ref 1) and (1/E)" is the addition to the value of the reciprocal modulus due to degrees of freedom associated with the existence of an additional parameter. In solid substitutional solutions and alloys with long-range order these additional parameters are the degree of preferred

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On the Theory of Internal Friction in Substitutional and Interstitial Solid Solutions

distribution of the substituted atoms and the degree of long-range order respectively. If $\Phi(T,\sigma,\eta)$ is the non-equilibrium thermodynamic potential, then in equilibrium:

$$\Phi_\eta(T, \sigma, \eta) = 0 \qquad (3)$$

and hence one can obtain the additional parameter η as a function of σ and T (Eq 4). If Eq (5) is differentiated twice with respect to σ one obtains Eq (6), where $\Phi(T,\sigma)$ is the equilibrium thermodynamic potential and $-\Phi_{\sigma\sigma} = 1/E'$. A comparison of Eqs (3) and (4) gives Eq (7) and it then follows from Eq (6) that $(1/E)''$ is given by Eq (8). If the identity given by Eq (5) is differentiated twice with respect to temperature, then using Eq (7) one obtains the expression for the specific heat due to degrees of freedom associated with the existence of the additional parameter which is given by Eq (9). A combination of Eqs (8) and (9) gives

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On the Theory of Internal Friction in Substitutional and Interstitial Solid Solutions

correct. Instead, the relaxation time given by Eq (29) of the present paper should be used.
There are 1 figure and 25 references, 11 of which are Soviet, 8 English, 3 German and 3 International.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, Ac.Sc., USSR)

SUBMITTED: April 25, 1958

4

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67751

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24.1800

SOV/126-8-5-3/29

AUTHOR: Shmatov, V.T.

TITLE: Relaxational Absorption of Ultrasonic Waves in Ferromagnetics

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, 1959, Nr 5, pp 667-670 (USSR)

ABSTRACT: Using the thermodynamic theory of relaxation phenomena (Refs 1, 2), formulae are obtained for the absorption coefficient and the dispersion of ultrasonic waves in ferromagnetics. For longitudinal vibrations, the complex velocity of sound of frequency ω is given by Eq (1) (Refs 2, 8), where C_0 is the usual Laplace velocity of sound, $\tau_{\sigma S}$ and $\tau_{\varepsilon S}$ are the relaxation times for the degree of ferromagnetic order y at constant stress σ, deformation ε, and entropy S. Using this expression, it can be shown (Refs 1, 3) that the velocity of sound and the absorption coefficient are given by Eqs (2) and (3). The degree of relaxation of the adiabatic Young's modulus can be written in the form given by Eq.(4), where E_T is the isothermal Young's modulus, E'_T is the non-relaxing part of Young's modulus, i.e. that part of the modulus which

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Relaxational Absorption of Ultrasonic Waves in Ferromagnetics

does not include the contribution due to ferromagnetic order, c_σ and c_ε are the specific heats, and c'_σ and c'_ε are the specific heats not including the effect of ferromagnetic order. Since the ratios of the moduli and the specific heats are close to unity, Eq (4) may be replaced by Eq (5), where $(1/E_T)''$ is the contribution of the ferromagnetic order to the magnitude of the reciprocal of the isothermal Young's modulus. The second term in Eq (5) is of the order of 10^{-4} and hence the degree of relaxation will be determined by the first term only. It is clear from Eq (3) that when $\omega\tau^{eS} = 1$, the absorption of sound will have a resonance character. The degree of relaxation of the isothermal Young's modulus can be expressed in terms of the degree of ferromagnetic order using Eq (6) which was obtained by the present author in Ref 10, where c''_σ is the additional specific heat due to the existence of ferromagnetic order. Using the Weiss theory (Ref 3), one has Eq (7), and hence Eq (8), where Θ is the Curie temperature, k is Boltzmann's constant, and N is the number of uncompensated spin moments per unit volume.

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Relaxational Absorption of Ultrasonic Waves in Ferromagnetics

As can be seen from Eq (8), the degree of relaxation, and hence the absorption of sound at frequencies given by $\omega\tau \gtrsim 1$, increases with increasing temperature and reaches a maximum at the Curie point at which Eq (9) holds. If the ferromagnet is placed in an external magnetic field H, then instead of Eq (7) one has Eq (10) (Ref 3), where μ_0 is the Bohr magneton. Hence, using Eq (6) one finds that in this case the degree of relaxation is again given by Eq (8) but now the degree of ferromagnetic order is a function of the external field, and hence the degree of relaxation is determined not by the spontaneous magnetization but by the true magnetization. However, the increase in the magnetization due to the external field is small and does not play an important part in a wide range of fields and temperatures. The effect of the external field need only be taken into account near the Curie point. The shortcoming of the Weiss theory is the fact that it neglects ferromagnetic order at short distances. If this approximation is removed, one obtains (Refs 3, 4) instead of Eq (7) the expressions given by Eqs (11) and

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67751

SOV/126-8-5-3/29

Relaxational Absorption of Ultrasonic Waves in Ferromagnetics

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals, Academy of Sciences USSR)

SUBMITTED: January 19, 1959.

This is an abridged translation.

Card 5/5

SHMATOV, V.T.; GRIN', A.V.

Mechanism of the occurrence of internal friction impurities peak. Fiz.met.i metalloved. 8 no.6:829-833 D '59. (MIRA 13:6)

1. Institut fiziki metallov AN SSSR.
(Internal friction) (Alloys—Metallography)

67657
SOV/126-8-6-4/24

18.8200

AUTHORS: Shmatov, V.T. and Grin', A.V.

TITLE: The Mechanism of Formation of an Impurity Peak of Internal Friction

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 6, pp 829-833 (USSR)

ABSTRACT: In polycrystalline pure metals only one internal friction peak is observed at high temperatures. Since such a peak is absent in monocrystals of pure metals, its appearance is ascribed to relaxation at the grain boundaries. When impurities are introduced into pure metals, an additional internal friction peak appears; it is known as an impurity peak. From the systematic investigations of this impurity peak, carried out by several workers (Ref 1 to 5), the authors draw the following general conclusions:
(1) Even small amounts of impurity (0.03 atomic %. Ref 3) may produce an impurity peak of internal friction.
(2) On increase of the impurity concentration the impurity-peak height generally rises but in certain alloys it reaches a maximum and then falls or even disappears completely (Ref 6) at higher impurity concentrations.
(3) The activation energy of relaxation processes

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The Mechanism of Formation of an Impurity Peak of Internal Friction

responsible for the impurity peak is close to the activation energy of diffusion of atoms, provided the impurity concentration is sufficiently great.
(4) With increase of the impurity concentration the internal friction peak due to relaxation at the grain boundaries (observed in pure polycrystals) is depressed and may disappear altogether (Ref 1 to 3, 6).
(5) The impurity peak is found only in polycrystals and not in monocrystals and consequently, just like the peak observed in pure polycrystals, it is due to processes occurring at the grain boundaries.
(6) The magnitude of the impurity peak is only slightly affected by the change in the mean grain dimensions (it falls gradually with increase of these dimensions; Ref 3 and 6). In contrast, the relaxation time related to the impurity peak depends strongly on the mean grain dimensions, rising rapidly with increase of the latter. The experimental observations summarized in the above six points can be explained as follows. Impurities are concentrated predominantly at the grain boundaries because the energy of distortion by an impurity atom is lower at

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The Mechanism of Formation of an Impurity Peak of Internal Friction

the grain boundary than inside the grain. Elastic deformation which alters this distortion energy would either favour or obstruct accumulation of impurity atoms at the grain boundaries. Consequently if such deformation is varied periodically the impurity atom concentration at the grain boundaries will also vary periodically. If elastic deformation alternates sufficiently rapidly the changes of the impurity concentration will not manage to follow elastic deformation and this will, of course, lead to dissipation of elastic energy, ie to an impurity peak at appropriate frequencies. The authors discuss this mechanism mathematically and show that it explains satisfactorily the experimental data summarized in the points (1) to (6) above. The paper is entirely theoretical. There are 10 references, 4 of which are Soviet, 4 English and 2 international.

ASSOCIATION: Institut fiziki metallov AN SSSR (Metal Physics Institute, AS USSR)
SUBMITTED: April 15, 1959
Card 3/3

SHMATOV, V.T.

PHASE I BOOK EXPLOITATION SOV/5305

Moscow. Institut stali

Relaksatsionnyye yavleniya v metallakh i splavakh; trudy Mezhvuzovskogo soveshchaniya (Relaxation Phenomena in Metals and Alloys; Transactions of the Inter-Institute Conference) Moscow, Metallurgizdat, 1960. 326 p.

Sponsoring Agency: Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya RSFSR and Moskovskiy institut stali imeni I.V. Stalina.

Ed. (Title page): B.N. Finkel'shteyn; Ed, of Publishing House: Ye.I. Levit; Tech. Ed.: A.I. Karasev.

PURPOSE: This collection of articles is intended for personnel in scientific institutions and schools of higher education and for physical metallurgists and physicists specializing in metals. It may also be useful to students of these fields.

COVERAGE: The collection contains results of experimental and theoretical investigations carried out by schools of higher education and scientific research

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institutions in the field of the relaxation phenomena in metals and alloys. Several articles are devoted to the investigation—by the internal-friction method—of the decomposition of supersaturated solid solutions. Also analyzed are the defects of the crystalline lattice, plastic deformations, high-temperature behavior of alloys, and creep. Problems of the relation between internal friction and temper brittleness, the use of the method of internal friction in the investigation of powder-metallurgy products, and the mechanism of impact fatigue are discussed. The collection also contains articles on the damping characteristics of materials, elastic after-effect, and the new slow-detection method. No personalities are mentioned. References follow most articles. There are 366 references: 192 Soviet and 174 non-Soviet.

TABLE OF CONTENTS:

S/137/61/000/012/127/149
A006/A101

Internal friction ...

slip traces, etc); 4) to study processes proceeding in the metal with time (ordering, aging, relaxation, etc.). There are 122 references.

V. Stepanov

[Abstracter's note: Complete translation]

Card 2/2

87210
S/126/60/010/001/022/027/XX
E201/E391

A Theory of Internal Friction Due to Short-range Order Relaxation in Substitutional Solid Solutions

Le Claire and Lomer did not distinguish between the solvent and the solute atoms and allowed for the effect of all three types of atom pairs (AA, AB and BB) during deformation. Le Claire and Lomer assumed that the total free energy of a solid solution can be adequately represented by the configurational term. This is wrong. Nevertheless Le Claire and Lomer's main result (a formula which gives relaxation of the elastic constants) is correct, since in relaxation of the elastic constants due to changes in short-range order all non-configurational contributions to the free energy can be neglected. The present paper develops Le Claire's and Lomer's theory in such a way that it is free of inconsistencies. The author obtains expressions for the degree of relaxation of the

Card 2/3

SHMATOV, V.T.

Thermodynamic theory of systems with additional parameters. Fiz. met. i metalloved. 11 no. 2:170-180 F '61. (MIRA 14:5)

1. Institut fiziki metallov AN SSSR.
(Alloys—Thermal properties) (Phase rule and equilibrium)

S/126/61/012/004/014/021
E032/E535

AUTHORS: Shmatov, V.T. and Grin', A.V.

TITLE: High-temperature internal friction in metals

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.4, 1961, 600-606

TEXT: The investigation relates to the high temperature internal friction background as well as to the peak of internal friction at grain boundaries. The first is attributed to non-equilibrium changes in the concentration of vacancies in the body of the grain, whilst the latter is associated with similar changes in the concentration of vacancies at grain boundaries. The authors support the view that the rapid increase in internal friction at high temperatures can be associated with vacancies whose number is known to increase very rapidly with increasing temperature. They assume that the internal friction background is due to non-equilibrium changes in the number of vacancies during periodic deformation of the specimen. Thus, it is well known that the concentration of vacancies in a metal is a function of state. While the specimen is tested for internal friction, the applied periodic deformation changes its state and therefore there should

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body, depending on the nature and period of deformation. Any lag between the variation in the concentration of vacancies and the periodic deformation will give rise to damping of the vibrations, i.e. to internal friction. This mechanism is identical to that put forward by the present authors in Ref.13 (FMM, 1959, 8, 829) for elucidating the nature of the impurity peak of internal friction at grain boundaries, the only difference being that in the present case the impurities are replaced by the vacancies. Again, thermodynamic calculations involving the relaxation time of elastic moduli are used to develop quantitative relationships for this effect. It is shown that the relaxation time has a much stronger dependence on the number of grains per unit of volume than the height of the peak ($q^{-5/3}$ as compared with $q^{1/3}$). This is in qualitative agreement with the measurements of T. S. Ke (Ref.28: Phys.Rev., 1947, 72, 41) on aluminium and those of W. Koster et al. (Ref.6: Zs. Metallkunde, 1956, 47, 224 and Ref.18: Ibid, 1955, 46, 84) on gold and copper. There are 28 references: 8 Soviet-bloc and 20 non-Soviet-bloc. The English-language references read as follows: Ref.2: Weertman T.,

Salkovitz E. Acta met., 1955, 3, 1; Ref.3: Hiku Y. J.Phys.Soc. Japan, 1958, 13, 1138; 1959, 14, 590; Ref.4: Beshers D.J.Appl.Phys., 1959, 30, 252; Ref.27: Feltham P., Copley G. Acta met., 1958, 6, 539.

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals AS USSR)

SUBMITTED: February 20, 1961

15633

S/126/63/015/001/004/029
E193/E383

24750

AUTHOR: Shmatov, V.T.

TITLE: Dependence of the elastic constants of binary alloys on the degree of order

PERIODICAL: Fizika metallov i metallovedeniye, v. 15, no. 1, 1963, 36 - 44

TEXT: Using his earlier conclusions (FMM, 1961, 11, 170), based on thermodynamic considerations, and the microscopic theory of ordering, the present author derived formulae expressing the three elastic constants c_{11}, c_{12} and c_{14} of a cubic crystal in terms of the degree of long-range order. An expression for the elastic modulus s_{11} of a binary alloy, as a function of short-range order, was also derived. Qualitative agreement between theory and experimental data for β-brass was demonstrated and the magnitude of the shift of the Curie point, caused by the action of elastic stresses in β-brass, was evaluated. There are 2 tables.

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S/126/63/015/001/004/029
Dependence of E193/E383

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals of the AS USSR)

SUBMITTED: December 19, 1960 (initially)
June 11, 1962 (after revision)

Card 2/2

SHMATOV, V.T.

Temperature relaxation in metals. Fiz.-met. i metalloved. 20 no.5:647-652 N '65. (MIRA 18:12)

1. Institut fiziki metallov AN SSSR. Submitted February 18, 1965.

ACC NR: AP7005134 SOURCE CODE: UR/0126/66/022/004/0598/0605

AUTHOR: Pavlov, V. A.; Shalayev, V. I.; Shmatov, V. T.

ORG: Institute of Metal Physics, AN SSSR (Institut fiziki metallov AN SSSR)

TITLE: Radiometallographic examination of the substructure of aluminum during creep

SOURCE: Fizika metallov i metallovedeniye, v. 22, no. 4, 1966, 598-605

TOPIC TAGS: x ray tube, x ray investigation, metal grain structure, creep / BSV x-ray tube

ABSTRACT: There exists a region of deformation in which the shear mechanism of plastic deformation during creep combines with the diffusion processes of recovery, and the course of plastic deformation during the steady-state stage of creep in this region is best described by Weertman's theory (J. Appl. Phys., 1955, 26, 1213; 1957, 28, 362). According to Weertman, during the steady-state stage of creep the nonconservative movement of dislocations at right angles to the slip plane represents the mechanism regulating the dynamic equilibrium between the processes of hardening and recovery. Then creep is accompanied by the appearance of a substructure whose development can be experimentally traced. Hence the authors, using Weertman's models as the basis, calculated and compared with experimental findings the development and behavior of elements of the substructure of individual grains of

UDC: 539.376:548.73

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SHMATOVA, M. I. PA 10/49T28

USSR/Chemistry - Xylose, Solutions Jun 48
Chemistry - Lime

"The Purification of Xylose Solutions With Calcium Oxide," N. A. Sychev, M. I. Shmatova, Chair of Org and Biol Chem, Stavropol'sk Agr Inst, 3¼ pp

"Zhur Priklad Khimii" Vol XXI, No 6

Describes new method of purifying xylose solutions by treating them with lime. Principle is colloido-chemical coagulation reaction of calcium salts of sulfoligninic (lignosulfuric) acids. Dialysis has no advantages over method described. Submitted 11 Jun 47.

10/49T28

SOV/137-58-11-23383

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 11, p 220 (USSR)

AUTHORS: Sirota, N. N., Belyayevskiy, V. I., Shmatova, G. P.

TITLE: A Study of the Physical Properties of Solid Solutions and of Processes of Aging in Al-Mg-Si Alloys Containing 99% Al (Izucheniye fizicheskikh svoystv tverdykh rastvorov i protsessa stareniya splavov Al-Mg-Si, soderzhashchikh 99% Al)

PERIODICAL: Sb. nauchn. tr. Mosk. in-t tsvetn. met. i zolota, Nauchno-tekhn. o-vo tsvetn. metallurgii, 1957, Nr 30, pp 223-234

ABSTRACT: It is shown that the hardness, the modulus of elasticity, and the electrical resistivity of alloys (quenched as well as aged) of the ternary Al-Mg-Si system along a section of the phase diagram corresponding to a constant Al content (99%) exhibit minimum values when the composition of the alloys corresponds to a quasi-binary section of Al-Mg_2Si (0.6 at. %Mg). It is concluded that the change in properties of the quenched alloys is caused by the presence of a short-range order which is most discernible in the vicinity of the quasi-binary section of Al-Mg_2Si. The increase in hardness occurring on both sides of the quasi-binary section after aging is attributable to an

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A Study of the Physical Properties of Solid Solutions (cont.)

increase in supersaturation, and the reduction of electrical resistivity in the vicinity of the quasi-binary section to a decrease in the number of segregations and an increase in their size to a point when they are larger than the free path of conduction electrons.

A. K.

BUR'YA, Yu.; VASIL'YEVSKAYA, O.; KOBZIKOVA, Ye.; SMETANENKO, Ye.; SHMATOVA, M.

Sterilization of milk by high-frequency currents. Moloch. prom. 18 no.4: 27-29 '57. (MLRA 10:4)
(Milk--Sterilization) (Electric currents) (Conveying machinery)

FIALKOVSKAYA, Ye.A. [Fialkovs'ka, O.O.]; SLADKOMEDOVA, A.I. [Sladkomedova, O.I.]; SHMATOVA, M.N.[Shmatova, M.M.]

Formation of the resistance to rust and smuts in winter and spring wheat hybrids. Trudy Inst. gen. i sel. AN URSR 5:56-62 '58. (MIRA 11:9)

(Wheat--Disease and pest resistance) (Uredineae) (Smuts)

SHMAKOVA, N.L.

Cytological analysis of high energy proton action. Report No.3. Dosage units and the dynamics of chromosome aberrations and of mitotic index in the bone marrow of mice irradiated with 660 Mev protons and gamma rays Co^{60}. Radiobiologiia 5 no.2:275-278 '65.

(MIRA 18:12)

1. Institut gigiyeny truda i professional'nykh zabolevaniy AMN SSSR, Moskva.

ZHMATOVA, Z.I.; SMIRNOVA, N.I.

New types of lubricating coolants. Neftepor. i neftekhim. no.3: 45-46 '63. (MIRA 17:9)

1. Rostovskiy-na-Donu opytnyy neftemaslozavod.

YANISHEVSKIY, N., general-mayor voysk svyazi; SHMATOVICH, E., polkovnik

Amateur radio competitions in the armed forces. Voen. vest. 42 no.6:100-102 Je '62. (MIRA 15:6)

(Radio, Military)

112-57-7-14348D

Translation from: Referativnyy zhurnal, Elektrotekhnika, 1957, Nr 7, p 84 (USSR)

AUTHOR: Shmatovich, V. V.

TITLE: Autovalve Lightning Arrester for DC High-Voltage Systems (Ventil'nyy razryadnik dlya ustanovok postoyannogo vysokogo napryazheniya)

ABSTRACT: Bibliographic entry on the author's dissertation for the degree of Candidate of Technical Sciences, presented to Vses. elektrotekhn. in-t (The All-Union Electrical-Engineering Institute), Moscow, 1956.

ASSOCIATION: Vses. elektrotekhn. in-t (The All-Union Electrical-Engineering Institute)

Card 1/1

A standard series of main parameters..

draft standard for magnetic-valve arresters, and of the prospects of developing new arresters with improved protection, the following series of protection ratios is recommended for arresters rated from 3 to 500 kV: 3.3-3.1; 3.0-2.8; 2.6-2.5; 2.5-2.3; 2.2-2.1; 2.0-1.9; 1.9-1.8. It is recommended that the standard series of arresters rated from 3 to 220 kV should be arranged according to the parameters of the maximum value of short-circuit current interrupted in each voltage class, with an indication of the minimum permissible value of the ratio of highest to lowest short-circuit current interrupted. It is possible to increase the interrupting capacity of tubular arresters type PTB (RTV) by reinforcing them by a multi-layer winding of glass fibre cloth grade ЭСТВ-6 (ESTV-6) applied to the thin-walled arc-suppression tube, which is made of hard polyvinyl chloride plastic. In this way arresters have been developed for voltages of 35 - 110 kV and short-circuit currents of 20 kA. However, it is not yet technically possible to develop tubular arresters for voltages of 35 - 220 kV for interrupting short-circuit currents exceeding 30 kA, and coordinating gaps combined with automatic repeated reclosure of the lines are the recommended alternative.

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A standard series of main parameters.. S/196/61/000/009/038/052
E194/E155

A standard series of tubular arresters from 3 to 220 kV selected according to the maximum values of short-circuit current interrupted can be: 2.5; 5; 10; 20; and 30 kA effective. Here the minimum ratio of the maximum permissible short-circuit current to the minimum for tubular arresters of 3 - 6 - 10 kV should be 8; for those of 35 - 60 - 110 - 220 kV the recommended figure is 5. In conformity with the existing standard series of tubular arresters, the nomenclature PTФ (RTF), RTV, and PTBУ (RTVU) is applied to the new arresters in the range from 3 to 220 kV. They should be developed and manufactured for various voltages and ranges of short-circuit current interrupted, and each voltage class should be provided with fittings for mounting and recording operations. It is proposed to develop tubular arresters for voltages of 3 - 6 - 10 kV using cheap, strong and moisture-resistant materials, and to satisfy the demand for tubular arresters for 35 - 60 - 110 - 220 kV by types RTV and RTVU. The proposed classification will help to avoid duplication of manufacture of electrical equipment and will most conveniently satisfy the design organisations, operating companies and

Card 3/4

SAVEL'YEV, V.P., kand.tekhn.nauk; SHMATOVICH, V.V., kand.tekhn.nauk

Protection against atmospheric overvoltages with 220, 330, and 500 kv. arresters with magnetic quenching of arc. Vest.elektroprom. 31 no.1:24-30 Ja '60. (MIRA 13:5)
(Lightning protection) (Electric lines)

SAVEL'YEV, V.P. kand.tekhn.nauk; SHMATOVICH, V.V., kand.tekhn.nauk
PRUZHININA, V.I., kand.tekhn.nauk; PUGACHEV, V.K., inzh.

Combination magnetic-valve discharger for 500 kv. voltages.
Elektrichestvo no.4:13-20 Ap '61. (MIRA 14:8)

1. Vsesoyuznyy elektrotekhnicheskiy institut imeni Lenina.
(Electric protection)

S/105/62/000/001/005/006
E194/E455

AUTHORS: Butkevich, G.V., Doctor of Technical Sciences, Professor; Shmatovich, V.V., Candidate of Technical Sciences

TITLE: A unit-type spark-gap valve lightning-arrester with 100% recovery strength

PERIODICAL: Elektrichestvo, no.1, 1962, 55-58

TEXT: Existing magnetic-valve type 500 kV arresters can limit the overvoltage to 2.34 x phase voltage and suppress follow-up currents of up to 1500 A at a recovery voltage of 1.6 x phase voltage. Higher recovery voltages, which are required, can be obtained by ensuring uneven distribution of voltage between spark gaps during breakdown and uniform voltage distribution during current suppression. The principle has been adopted in protecting series capacitor banks in Sweden and in the USSR, but only to reduce the scatter of breakdown voltage of large gaps. A schematic diagram of the device is shown in Fig.1; the two main gaps 1 and 2 are each shunted by equal high-value resistors 3 and 4. The auxiliary gap 5 has a lower breakdown voltage than the main gaps and breaks down first (provided that its breakdown voltage is more than half the main gap breakdown voltage).

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A unit-type spark-gap valve ...

causing breakdown of the main gap and immediate extinction of gap 5. The recovery voltage of the two main gaps is unaffected by gap 5 because the current through the latter, limited by the resistance 6, is small and it recovers its breakdown strength quickly. The construction of an arrester based on this principle is described. The two main gaps and associated resistors form a unit and these units can be built up into a multiple-gap arrester. To achieve 100% recovery voltage, the breakdown voltage of each main gap should be not more than 50%. One hundred percent recovery voltage can easily be achieved in about 3.5 microseconds, after a current impulse of 1500 A for 10 microseconds. The spark gaps in the units are made annular and permanent magnets are fitted above and below each element to set up a magnetic field in the spark gaps. Ceramic resistors are used. An experimental prototype gave a breakdown voltage of 7.82 kV max $\pm$ 2.5% across two main gaps, the auxiliary gap broke down at a voltage of 5.92 kV max $\pm$ 5.5%. After passing a current of 1500 A for ten microseconds, full recovery voltage was maintained. The recovery time of 4.25 microseconds could be increased by reducing the breakdown voltage of the auxiliary gap.

Card 2/3

AKOPYAN, A.A., kand.tekhn.nauk; PANOV, A.V., kand.tekhn.nauk; SHMATOVICH, V.V., kand.tekhn.nauk; YAROSHENKO, A.I., inzh.

Overvoltage levels and insulation requirements in 700 kv. a.c. power transmission lines. Vest.elektroprom. 33 no.2:4-11 F '62. (MIRA 15:2)

(Electric power distribution--Alternating current)

SHMATOVICH, V.V., kand.tekhn.nauk

Increased voltage quenching capability of a composite RVMK-500 magnetic-valve discharger with nonhomogeneous shunting. Elektrichestvo no.2:66-69 F '63. (MIRA 16:5)

1. Vsesoyuznyy elektrotekhnicheskiy institut imeni V.I.Lenina.
(Electric discharges) (Electric protection)
(Electric power distribution)

ACCESSION NR: AT4038168

single outputs, each of which can be connected only to the input of one element. The algorithm consists of examining in sequence the sets G_0, G_1, ..., G_m, ..., where G_m consists of all the circuits with m elements (of all the logic formulas using only the operations of multiplication, addition and negation, with m operations). The algorithm considered in the article is that of constructing the set G_m, as well as some limitations which make it possible to reduce the volume of the scanning necessary for the search for the optimal circuit. The algorithm consists of the following parts: 1) choose the next combination of attributes; 2) choose the next combination of signs; 3) compile the calculation program; 4) choose the next combination of initial variables; 5) calculate the function realized by the circuit under consideration. The limitations aimed at reducing the volume of scanning are also listed. Orig. art. has: 3 formulas.

Card 2/3

ACCESSION NR: AT4038168

ASSOCIATION: None

SUBMITTED: 00	DATE ACQ: 04Jun64	ENCL: 00
SUB CODE: DP, MA	NR REF SOV: 002	OTHER: 000

Card 3/3

L 26705-66
ACC NR: AT5028451 SOURCE CODE: UR/2690/65/009/000/0145/0148

AUTHOR: Yakubaytis, E. A.; Shmaukstel', N. P. 29 B+1

ORG: none

TITLE: Synthesis and minimization of diagrams with real AND-NOT or OR-NOT logical elements

SOURCE: AN LatSSR. Institut elektroniki i vychislitel'noy tekhniki. Trudy, v. 9, 1965. Avtomatika i vychislitel'naya tekhnika, 145-148

TOPIC TAGS: logic design, minimization, function, algorithm, computer logic

ABSTRACT: If, according to the rule $\overline{f(A_1, \dots A_n, +, \cdot)} = f(\bar{A}_1, \dots, \bar{A}_n, \cdot, +)^1$, the NOT operation be performed on a specified disjunctive normal form (DNF) of a function free from hazardous contests, the resulting conjunctive normal form (CNF) will also be free from hazardous contests. If DNF and CNF be subjected to the Shannon transformation, the resulting disjunctive and conjunctive inverse forms (a) do not have hazardous contests and (b) describe OR-NOT and AND-NOT diagrams, respectively. Hence, this algorithm is recommended: (1) By using the Quine-McCluskey

Card 1/2 UDC: 62-507

L 26705-66
ACC NR: AT5028451 0

algorithm, a curtailed DNF of the corresponding function, free from hazardous contests, is obtained; (2) The curtailed DNF is minimized; (3) The Shannon transformation is performed; (4) If a disjunctive inverse function is synthesized, the function f_1 should be negated (NOT). An example illustrates the method. Orig. art. has: 12 formulas.

SUB CODE: 09,12/ SUBM DATE: none/ ORIG REF: 002/ OTH REF: 003

Card 2/2 mjs

L 04410-67 ENT(d) IJP(c)

ACC NR: AT6019740 SOURCE CODE: UR/3192/65/000/011/0049/0057

37
B+1

AUTHOR: Yakubaytis, E. A.; Shmaukstel', N. P.

ORG: none

TITLE: Methodology for the establishment of the minimal disjunctive normal form of functions free of hazardous competitions

SOURCE: Akademiya nauk Latviyskoy SSR. Institut elektroniki i vychislitel'noy tekhniki. Avtomatika i vychislitel'naya tekhnika, no. 11, 1965, 49-57

TOPIC TAGS: electric relay, function theory, logic element

ABSTRACT: For the establishment of the minimal normal disjunctive form (16) the authors offer a method for the establishment of all dead-end form free of competitions. Dead-end are those forms for which the removal of even a single implicant is followed by either the disruption of the logical equivalence or the appearance of hazardous competitions. To obtain such dead-end forms from the abreviated disjunctive normal form certain simple implicants are removed from the function in such a way that the remaining implicants cover all the proximities appearing in the perfect disjunctive normal form of the function. The method is based on the con-

Card 1/2 UDC: 62.507

L 04410-67

ACC NR: AT6019740

junctive representation of a certain table called the gluing table. Two illustrative examples are worked out and a program for the minimum disjunctive normal form is outlined. Orig. art. has: 4 formulas, 2 figures, and 3 tables.

SUB CODE: 12/ SUBM DATE: 00Nov64/ ORIG REF: 001

Card 2/2

SHMAVONYAN, D.M.

Changes in gastric secretion and motor functions induced in gastritis patients by Ankavan therapeutic waters. Vop.kur., fizioter. i lech. fiz.kul't. no.4:81 O-D '55. (MIRA 12:12)

1. Vypolnena v Institute kurortologii i fizicheskikh metodov lecheniya ArmSSR.
(STOMACH--DISEASES) (ANKAVAN--MINERAL WATERS)

SHAVONYAN, D.M., kand.med.nauk

Dependence of the level of arterial pressure on the stimulation of the mechanoreceptors. Vop.kardiol. no.1:107-111 '56. (MIRA 12:9)

1. Iz Respub. Instituta kurortologii i fiz. metodov lecheniya Armyanskoy SSR.

(BLOOD PRESSURE) (DIGESTIVE ORGANS--INNERVATION)

SHMAVONYAN, Dzh. M.

On the problem of diet at sanatoriums relating to P.V.Saldaev's article on "Diet at sanatoriums in the light of I.P.Pavlov's contributions to physiology." Vop.kur. fizioter. i lech.fiz.kul't. 22 no.4:75-76 Jl-Ag '57. (MIRA 10:11)

1. Zaveduyushchiy otdelom organizatsii kurortov i kurortnykh uchrezhdeniy Instituta kurortologii Armyanskoy SSR.
(DIET IN DISEASE)

SHMAVONYAN, Dzh.M.; VARTAZARYAN, B.A.

Influence of Ankavan mineral water on the biligenic function of the liver. Vop.kur.,fizioter.i lech.fiz.kul't. 25 no.1:33-34 '60.
(MIRA 13:5)

1. Iz Instituta kurortologii i fizicheskikh metodov lecheniya Armyanskoy SSR (dir. S.A. Chshmarityan).
(ANKAVAN--MINERAL WATERS) (LIVER)

SHMAVONYAN, Dzh.M.

New therapeutic mineral water of Nor-Bayazet. Vop. kur., fizioter. i lech. fiz. kul't. 25 no.4:364 Jl-Ag '60. (MIRA 13:9)
(NOR-BAYAZET--MINERAL WATERS)

CHILINGARYAN, R.A.; SHMAVONYAN, Dzh.M.

Conference on problems in the investigation and use of the natural therapeutic resources of the Armenian S.S.R. Vop. kur., fizioter. i lech. fiz. kul't. 25 no.4:379-381 Jl-Ag '60. (MIRA 13:9)
(ARMENIA--THERAPEUTICS, PHYSIOLOGICAL)

KOVAL'SKIY, V.V.; YAROVAYA, G.A.; SHMAVONYAN, D.M.

Changes in the purine metabolism of man and animals under conditions prevailing in molydenum biogeochemical provinces. Zhur. ob. biol. 22 no.3:179-191 My-Je '61. (MIRA 14:5)

1. V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry, U.S.S.R. Academy of Sciences.
(PURINE METABOLISM) (MOLYBDENUM--PHYSIOLOGICAL EFFECT)
(ARMENIA--GOUT)

ASRATYAN, G.S.; STEPANYAN, M.S.; SHMAVONYAN, D.M.

Iodine content in soils and endemic goiter phenomena in Razdan District of the Armenian S.S.R. Izv. AN Arm.SSR.Biol.nauki 19 no.10:23-28 O '65. (MIRA 18:12)

1. Yerevanskiy zooveterinarnyy institut. Submitted Dec. 25, 1964.

SHMAVONYAN, P.M., veterinarnyy vrach

Sucking off and sterile filtration of the blood serum during the preparation of pregnant mare serum by citration. Veterinariia 40 no.3:71-73 Mr '63. (MIRA 17:1)

1. Armyanskaya respublikanskaya veterinarno-bakteriologicheskaya laboratoriya.

TRET'YAKOV, N.P., kand. tekhn. nauk; SHMAYENOK, E.I., inzh.

Protecting the inner surface of an absorption refrigerator from corrosion. Trudy LTIKHP 5:47-55 '54. (MIRA 11:3)
(Refrigeration and refrigerating machinery)
(Corrosion and anticorrosives)

SHMAYEVA, T.M.

NOVAKOVSKIY, M.S.; SHMAYEVA, T.M.

Polarographic study of coordination between Tl^{+} and $S_2O_3^{2-}$. Ukr. khim.zhur. 20 no.6:615-619 '54. (MLRA 8:3)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M.Gor'kogo, kafedra khimicheskoy tekhnologii.
(Compounds, Complex) (Thallium)

LAVRUSHIN, V.F.; SHMAYEVA, T.M.; NIKOLAYEVA, I.M.

Reaction of p-fuchsine, aniline blue, and their carbinols with acids.
Dokl.AN SSSR 105 no.3:492-495 N '55. (MLRA 9:3)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
Predstavleno akademikom A.N. Nesmeyanovym.
(Dyes and dyeing--Chemistry)

NESMEYANOV, A.N.; LAVRUSHIN, V.F.; SHMAYEVA, T.M.; PEREVALOVA, E.G.

Cleavage of the C -- C bond in compounds containing triphenylmethyl grouping. Izv.AN SSSR.Otd.khim.nauk no.3:309-312 Mr '56.(MLRA 9:8)

1. Moskovskiy gosudarstvennyy universitet imeni M.V. Lomonosova i Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.
(Carbon compounds)

SHMAYEVA, T. M.

Spectra and halochromism. III. Reaction of p-rosaniline, Aniline Blue and their carbinols with acids. V. F. Lavrushin and T. M. Shmaeva (State Univ., Kharkov). *Zhur. Obshchei Khim.* 26, 3070-81(1956); cf. C.A. 51, 5540f.—*p*-Fuchsin (I) and Aniline Blue (II) were examd. spectroscopically in the presence of acids and the spectra are reproduced. In EtOH I fails to interact with weak acids such as AcOH, CO_2, or H_3BO_3; these acids, however, yield I when added to I-carbinol solns. II is not affected by 15% H_2SO_4, 10% HCl, 75% H_3PO_4, 90% CCl_3CO_2H, or AcOH (100%); II forms from II-carbinol on addn. of these acids. Hence, in both cases the formation of the dyes must occur by a reaction at the carbinol group. II-carbinol also yields spectra which are identical with those of II when the carbinol is treated with the 3 weak acids named above. The authors suggest that structural formulas of triphenylmethane dyes should indicate their carbonium-ion nature with possible electronic conjugation involving all possible unshared electron pairs on the substituent amino groups. G. M. K.

cyclic derivative on the methane bond, and 2) by oxidation of this compound into the corresponding carbinol and subsequent salt formation reaction. In order to establish the true cause giving rise to the formation of the coloration, the authors made a spectrophotometric investigation of this phenomenon. The determination of the absorption spectra of alcoholic and sulfuric acid solutions of 2-dimethylamino-5-pyridyl carbinol, of di-(2-dimethylamino-5-pyridyl)-carbinol and di-(2-dimethylamino-5-pyridyl)-methane revealed that the absorption spectrum of the acid solution of the first compound (Fig. 1) differs little from the one of its alcoholic solution, whereas for the second compound (Fig. 2) there is a considerable difference between the curves of the acid and the alcoholic solution. There is a considerable difference also between the curves of heterocyclic methane derivative (Fig. 3). Thus, the occurrence of a red coloration on the dissolution of the above methane in hot sulfuric acid is to be explained by the formation of a dipyridyl carbonium salt (last scheme). There are 4 figures and 14 references, 8 of which are Soviet.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet (Khar'kov State University)

MAMONTOVSKIY, Ivan Aleksandrovich; SHMAYEVKA, Semen Matveyevich; KLOKOV, B.K., nauchn. red.; SOROKINA, M.I., red.; NESMYSLOVA, L.M., tekhn. red.

[Mechanization of winding, insulating, and stamping operations in the manufacture of asynchronous motors] Mekhanizatsiia obmotochno-izoliatsionnykh i shtampovochnykh rabot pri proizvodstve asinkhronnykh elektrodvigatelei. Moskva, Proftekhizdat, 1963. 109 p. (MIRA 17:1)

Category : USSR/Optics - Physical Optics K-5

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 2400

Author : Klimovskaya, K.L., Vishnevskiy, V.N., Shmayevskiy, V.Ye.
Title : On the Glow of Hydrazide of Tri-aminophthalic Acid

Orig Pub : Izv. AN SSSR, ser. fiz. 1954, 18, No 6, 694-695

Abstract : No abstract

Lvov State Univ. im. Franko

Card : 1/1

KLIMOVSKAYA, L.K.; SHMAYEVSKIY, V.Ye.

Investigation of chemiluminescence. Dop. ta pov. L'viv. un. no.5 pt.2:78-79 '55. (MLRA 9:10)

(Luminescence)

SHMAYEVSKIY, V.Ye.

Diurnal fluctuations of Ca/Cb in wheat. Dop. ta pov. L'viv.un. no.6 pt 2:67-68 '55. (MLRA 10:3)
(Wheat) (Chlorophyll)

SHIAYEVSKIY, V.Ye.; YASINSKAYA, A.A.

Using the direct current bridge for measuring the electric conductivity of ore minerals on the site. Min.sbor. no.14: 371-373 '60. (MIRA 15:2)

1. Gosudarstvennyy universitet imeni Ivana Franko, L'vov.
(Minerals--Electric properties)

S/126/61/011/002/022/025
E073/E335

24,7200 (1043, 1385, 1153)

AUTHORS: Gillier, Ya.L., Shmayevskiy, V.Ye. and Vadets, D.I.

TITLE: Investigation of the Pseudobinary Section ZnSb-CdSb by the Debye Method

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol. 11, No. 2, pp. 311 - 313

TEXT: The pseudobinary section between the two semiconductor compounds ZnSb and CdSb contains a number of semiconductor alloys (Refs. 1, 2). Only the extreme compounds of this section have been investigated by X-ray structural analysis, namely, the compounds ZnSb and CdSb (K.E. Almin, Acta chem.scand., 1948, 2, 400 - Ref. 3). The work described in this paper is a first attempt to apply X-ray structural analysis for investigating the entire section under consideration. As starting materials 99.999 and 99.99% Sb were used. According to spectrum analysis the Cd has the following admixtures: Pb thousandths %; Cu tenths %; Ag hundredths % and Ca tenths %. The materials were weighed with an accuracy of 1 mg and mixed in the ratios enumerated in Table 1 (the second and third columns give the

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composition in molecular %, the fourth and fifth columns in weight %) Fusion was carried out in porcelain crucibles in an electric muffle furnace under a flux consisting of a mixture of KCl and NaCl. The melt was intensively mixed with a graphite rod and then teemed in an iron mould. Homogenisation was effected in sealed pyrex ampules (these were first evacuated to 10^{-1} to 10^{-2} mm Hg) and following that for 100 hours at 240-270 °C. From the homogenised alloys powder was produced which was tempered in evacuated sealed glass ampules at 200 °C for 50 hours, which were then allowed to cool down with the furnace. From the thus-produced powder, 0.9 mm dia. cylindrical specimens were produced. The investigation was by means of YRG-1 (URS-70) apparatus, using copper radiation without a filter. A voltage of 35 kV and current intensity of 12 mA were applied to the tube, the exposure time being 7 hours. The chamber diameter was 86 mm. Under equal conditions, X-ray patterns of the starting components were produced. The distance between identical lines of the diffraction patterns

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Table 1:

Таблица 1

№ образца	Состав образца, молек. %		Состав образца, вес. %	
	ZnSb	CdSb	ZnSb	CdSb
1	100	—	100	—
2	90	10	87,8	12,2
3	80	20	76,2	23,8
4	70	30	65,1	34,9
5	65	35	59,7	40,3
6	60	40	54,5	45,5
7	55	45	49,4	50,6
8	50	50	44,4	55,6
9	45	55	39,5	60,5
10	40	60	34,8	65,2
11	35	65	30,1	69,9
12	30	70	25,5	74,5
13	20	80	16,7	83,3
14	10	90	8,2	91,8
15	—	100	—	100

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Table 2:

Lattice constants Таблица 2

№ образца	Значения постоянных решетки, кХ			
	a	*b*	*c*	*V*, (kX)³
1	6,145	7,715	7,805	370,085
2	6,170	7,750	7,895	377,470
3	6,190	7,785	7,945	383,060
4	6,230	7,840	7,965	389,235
5	6,245	7,865	7,995	392,915
6	6,250	7,910	8,045	397,790
7	6,290	7,970	8,070	404,690
8	6,295	7,975	8,075	405,460
9	6,310	8,005	8,110	409,660
10	6,310	7,995	8,100	408,045
11	6,330	8,055	8,135	414,620
12	6,340	8,065	8,155	417,035
13	6,375	8,125	8,195	424,395
14	6,400	8,175	8,240	431,090
15	6,415	8,200	8,255	434,210

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was measured with an accuracy up to 0.1 mm. The relative intensity of the lines was determined visually by means of a 10-unit scale. Recording (identification) of the X-ray diffraction patterns of ZnSb and CdSb was by the method of selection. The obtained hkl indices did not contradict the conditions of extinction for the space group $D_{2h}^{15} - P_{bca}$. No Cd, Zn and Sb lines were detected on the X-ray diffraction patterns. Comparison of the X-ray diffraction patterns of ZnSb and CdSb with those of intermediate alloys has shown that throughout the entire section the structure of these alloys does not change and the same applies to the space group. This fact enabled choosing indices for the diffraction patterns of the alloys of the entire ZnSb-CdSb section on the basis of the ratio of the intensities of the lines and the interplane distances. The lattice constants a, b, c were calculated by the method of least squares on the basis of general indices for all the alloys starting from $\Theta = 25^{\circ}$. The calculated lattice constants and the determined volume of the elementary cell for all the alloys are entered in Table 2

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(lattice constants, kX). The accuracy of the determinations was 0.005 kX. The obtained results, presented in plots as functions of the lattice parameter; Fig. 1, and of the elementary volume; Fig. 2, on the CdSb concentration (molec%), are curves with a hardly noticeable bend for a concentration of about 50 molec% ZnSb. This leads to the assumption of a process of ordering of the solid solution.
There are 2 figures, 2 tables and 3 references:
2 Soviet and 1 non-Soviet.

ASSOCIATION: Lvovskiy gosudarstvennyy universitet im. Iv. Franko (Lvov State University im. Iv. Franko)

SUBMITTED: June 27, 1960

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ρ decreased with increasing temperature; σ first decreased and then started to increase. The effect of the heat treatment on the properties of the specimens, is shown in graphs. From the temperature dependence of the specimens it is possible to determine the dependence of ρ and σ on the concentration of the components at various temperatures. With 50 mol. % CdSb, ordering of the solid solution takes place at temperatures above 150°C. A comparison of the temperature-dependence curves, obtained by the authors, with those obtained by other investigators, shows that the procedure used in the present investigation yields a higher degree of ordering. This is also confirmed by the sharper extrema of the curves (as compared to those in the references). There are 4 figures, 1 table and 5 references: 4 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: K. Toman, J.Phys, and Chem. Solids, 11, no. 3-4, 342, 1959.

ASSOCIATION: L'vivs'kyy derzhuniversytet im. Ivana Franka (L'viv State University im. Ivan Franko)

SUBMITTED: August 26, 1961

Card 2/2

ACCESSION NR: AP4009393 S/0126/63/016/006/0941/0943

AUTHORS: Shmayevskiy, V. Ye.; Nikolaychuk, A. G.

TITLE: Electrical conductivity and structure of thin ZnSb-CdSb film

SOURCE: Fizika metallov i metallovedeniye, v. 16, no. 6, 1963, 941-943

TOPIC TAGS: thin film, film, metal film, ZnSb CdSb thin film, thin film structure, thin film electrical conductivity, electron diffraction photograph, film electron diffraction pattern, ZnSb CdSb electron diffraction pattern, MOM 4 megohm meter, MVU 49 bridge

ABSTRACT: This work was carried out in order to study the structure of ZnSb-CdSb films and the relation of electrical conductivity to temperature in this material. These thin films were vacuum-precipitated on a series of cold glass, chemically cleaned plates. The electrical conductivity of the precipitated metal layers was measured in air with the use of a MVU-49 bridge and a MOM-4 megohm-meter. The results obtained are presented in Fig. 1 and Fig. 2 of the Enclosure. It was established that: 1) the relation of electrical conductivity of films to metal concentration was similar to that of massive polycrystalline samples; 2) in all

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ACCESSION NR: AP4009393

the varieties of metal concentration studied here, electrical conductivity increased with the increase in temperature; 3) high conductivity observed in the samples rich in CdSb was explained by a partial decomposition of this compound (during the precipitation process) into the components Cd and Sb; 4) the electron diffusion patterns obtained immediately after the metal precipitation had diffused lines; this was explained by a certain degree of structural disorderliness (the lines became well defined again after the samples were heated at 120-150C for 30 min); 5) the structure of thin films was of the type ZnSb. The lattice parameters decreased with the increase in ZnSb concentration; 6) the structure of CdSb was studied in order to check the possibility of its decomposition (into Cd and Sb) during precipitation. No lines corresponding to Cd or Sb were observed. Orig. art. has: 2 figures.

ASSOCIATION: L'vovskiy ordena Lenina gosuniversitet im. I. Franko (L'vov State University)

SUBMITTED: 23Feb63 DATE ACQ: 03Feb64 ENCL: 01

SUB CODE: ML NO REF SOV: 013 OTHER: 005

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SHKLYARSKIY, V.Ya. [Shkliarskyi, V.IA]

Nature of the solid solution $Cu_xCd_{1-x}Cl_2$. Ukr. fiz. zhur. 8 no.11: 1263-1265 N '63. (MIRA 17:9)

1. L'vovskiy gosudarstvennyy universitet im. Iv. Franko.